

2017-11-13

USV Navigation in a Real-Time Map using Intelligent Path Planner

Singh, Y

<http://hdl.handle.net/10026.1/10602>

10.4172/2168-9873-C1-014

Journal of Applied Mechanical Engineering

OMICS Publishing Group

All content in PEARL is protected by copyright law. Author manuscripts are made available in accordance with publisher policies. Please cite only the published version using the details provided on the item record or document. In the absence of an open licence (e.g. Creative Commons), permissions for further reuse of content should be sought from the publisher or author.

USV navigation in a real-time map using intelligent path planner

Yogang Singh, Sanjay Sharma, Robert Sutton and Daniel Hatton
University of Plymouth, UK

Unmanned surface vehicles (USV) are the recent trend in marine robotics due to their diverse application and easy deployment. Navigation of such USV in a real time marine environment is a major challenge and creates a need towards development of intelligent path planners which can increase the system autonomy. Many such intelligent path planning studies have been conducted in the area of mobile robotics but needs a lot more research to be conducted in area of marine robotics. In this study, a well-known intelligent path planner A* has been implemented in a real time map using safety distance from obstacle as the criteria towards generating optimal trajectory for a single USV navigation. Different safety distances from obstacles ranging from 10 pixels to 40 pixels have been used to generate optimal trajectory and comparative performance has been analyzed in terms of computational time and path length. In this study, Portsmouth Harbour has been considered as area of study to determine the effectiveness of A* algorithm with different safety distance from obstacle as constraint. Algorithm has been validated on computer-based simulations using C++ and OpenCV libraries.



Figure 1: Trajectories of A* with safety distance from obstacle : (a) 0 Pixels (b) 10 Pixels (c) 20 Pixels (d) 30 Pixels (e) 40 Pixels

Recent Publications

1. Singh Y, Bhattacharyya S K and Idichandy V G (2014) CFD approach to steady state analysis of an underwater glider. IEEE Oceans-St. John's, 1-5.
2. Upadhyay V K, Singh, Y and Idichandy V G (2015) Modelling and control of an underwater laboratory glider. IEEE Underwater Technology (UT) 1-8.
3. Singh Y, Bhattacharyya S K and Idichandy V G (2017) CFD approach to modelling, hydrodynamic analysis and motion characteristics of a laboratory underwater glider with experimental results. Journal of Ocean Engineering and Science. ISSN No: 2468-0133.
4. Palaniappan P K, Singh Y and Idichandy V G (2015) Numerical study of a twin sphere pressure hull and outer fairing for manned submersible. IEEE Underwater Technology (UT) 1-11.

Biography

Yogang Singh joined Plymouth University, UK as a Commonwealth Scholar in PhD programme under School of Engineering in 2015. He has more than 6 years of research experience in area of CFD and Marine Robotics with a particular interest in Hydrodynamics. He has built an in house underwater glider at IIT Madras, Chennai (India) where he completed his MS (by research) in 2015. Prior to that, he worked as Research Assistant in Government of India projects for a period of two years. At present, he is working on developing path planning algorithms for Swarm of Surface USV. His goal is to combine CFD techniques in conjugation with real time operation of marine robots such as underwater vehicles and submarines.

yogangs.singh@plymouth.ac.uk